Multimodal Analysis of Participatory Design Results

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Abstract
We describe a multimodal method for the analysis of participatory design (PD) results. The multimodal approach we take allows researchers to treat both verbal (notes, writings) and tangible material outcomes as equal ways of communicating design ideas. We argue that an integrated approach in which both PD outcomes are compared and contrasted can result in a richer analysis, in which underlying values can be identified more clearly. To illustrate the method, we describe a PD process with primary school children.

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Participatory Design; Fuzzy Front-End; Multimodality.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Participatory Design (PD) is a well-known methodology that can be useful in the fuzzy front end of design, to determine the specific experiences to aim for when designing technology. Future users are at the core of the methodology: in PD, these users are considered co-designers of their technology, and of the practices that may be reified in that technology. In an attempt to determine the specific experiences to design for, recent work by Iversen et al. [2] has attempted to rekindle

values in a more 'authentic' approach towards PD. This work focuses on the values that emerge and develop over the course of the design process. Instead of taking values for granted, Iversen et al. start from the emergent values as 'the engine that drives the design process' [2]. In this paper, we describe a case study of a PD session analysis, focusing on these underlying values: the things that a person or group of people consider(s) important in life [5]. We used an integrated multi-modal analysis [3] of session transcripts, written ideas on Post-Its (verbal material), and the designed artefacts (visual/tangible material). We argue that underlying values can be identified more clearly using an in-depth, integrated approach in which both the verbal and visual/tangible PD outcomes are analyzed.

Specifically, we focus on a case in which 49 primary school children aged 9 to 10 were involved in PD sessions on designing a tangible, digital toolkit to facilitate class groups of primary school children to become more self-regulatory in combating traditional bullying as well as cyberbullying. Bullying, both online and offline, is a complex problem often related to existing social contexts such as the classroom. Tangible interaction offers interesting opportunities to bridge the gap between children's online and offline worlds, and to stimulate pro-social behaviour on both levels. Furthermore, tangible digital tools can easily be embedded in a classroom for structural use.

This specific case of co-designing digital tools for the prevention of bullying is used to illustrate the integrated, multi-modal analysis of PD results. This approach allowed us to analyze the children's ideas and underlying values: these values, in turn, provide designers with a solid starting point for design.

Related Work

Participatory Design with Children

Scaife & Rogers [4] acknowledge the difficulty of involving children in more open-ended, future directed work. "On the one hand, the kids come up with many wonderful suggestions [...], on the other hand, many of their ideas are unworkable in computing terms". This quote is exemplary for a tendency to analyse co-design artefacts solely in 'computing terms', that is, on a functional or attribute level (e.g. [11][9]). However, the values that are implicitly expressed in PD outcomes are often more interesting than the design ideas as products per se. Focusing on the underlying motives behind design choices can reveal why specific design attributes are important and how they serve children's values. Climbing up the 'value ladder' enables researchers to reach out into the 'opportunity spaces', rather than being limited to problem solving right from the onset. Moreover, making values explicit opens up possibilities for a re-alignment of values between adults and children, as well as across groups of children working together [6]. Since values are dynamic in nature, we cannot simply identify them, and design for them. PD, in its authentic sense, aims at reformulating values and transcending possible value conflicts [2].

Multi-Modal Analysis

Multimodality, an approach based on social semiotics, views communication and representation 'as more than language and attends systematically to the social interpretation of a range of forms of making meaning' [3]. As such, it provides a framework for the analysis of various ways of communicating, including spoken and written language, but also visual, gestural and other modes. This type of analysis has been used in various analyses of e.g. educational games and social network-

Figure 1: Elements in the PD process: descriptions of how a superhero would solve problems (top), and the materials used to create the artifacts (bottom).

ing [3]. We argue this approach is also useful in PD, as researchers often limit themselves to a descriptive analysis of co-design artifacts or rely exclusively on what participants say or write about their creations (e.g. [8][9]). Buckingham refers to this approach as 'naïve empiricism' [7], arguing that data from creative research cannot be taken at face value: these data need to be analyzed with special attention for its visual dimensions. A multimodal approach is suitable for this analysis, as it allows for an integration of both the textual transcripts and the artifacts. Speech (verbal explanation) and artifacts can be treated as different *modes* used to communicate the same ideas.

Method

Participatory Design

We used a blend of two different approaches to PD: cooperative inquiry [9] and contextmapping [8] (see [10] for an in-depth description of the method used). The PD sessions took place in two schools with 49 children and resulted in 11 co-design artifacts created by an equal number of groups of 4 to 5 children. One researcher was involved in each PD session facilitating two to three groups of children at the same time. The material used for analysis consists of various elements from the PD process (see figure 1). For each group, we analyzed:

1. a short description of two problematic class situations defined by the children (e.g. children excluding each other from playing games, not listening to each other,...);
2. verbal descriptions on post-its of how a super hero would solve these problems (e.g. Batman sending 'bad' children to jail). From these solutions, the children picked two for further elaboration;
3. a co-designed artifact that embodies the solutions chosen in 2;
4. a verbal presentation of the artifact.

Based on these elements, we analyze the PD process starting from the children's original ideas (1 and 2), and evolving towards the eventual results (3 and 4). Through a comparative analysis between the original ideas and the results, we can determine how values emerge and evolve throughout the PD process.

Multimodal Analysis

Verbal communication and tangible artifacts, as different modes, have different affordances: each has specific characteristics that make it more suitable for communicating specific information. For instance, while speech is more suitable for narratives, material or visual objects can be easier to communicate moods, emotion, style, etc. (figure 2). Integrating both modes in an analysis of PD outcomes can therefore offer a comprehensive analysis of different information types.

Visual and material objects can, however, be interpreted in different ways, and it can be difficult to make interpretations that are meaningful and valid in the context of the PD process. We engage in a 'close reading' [1], identifying recurring themes, and arriving at interpretations through detailed analyses of both the artefact and the transcriptions. In a data interpretation phase, two researchers independently conducted their close readings in order to identify relevant values and themes in the data. Afterwards, the researchers collaborated to refine the themes they identified, arriving at a common understanding of the data.

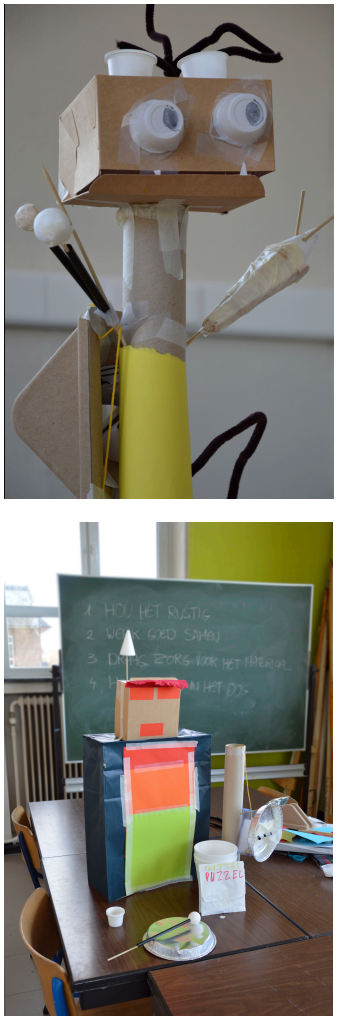

Figure 2: A goofy-looking (top) and a severe-looking robot figure (bottom).

Group	1		2		3		4		5		6	
	positive	negative	positive	negative	positive	negative	positive	negative	positive	negative	positive	negative
Number of ideas	10	11	8	3	6	8	9	4	7	2	10	7
Selected ideas	1	1	2	0	1	1	2	0	2	0	1	1

Figure 3: Number of initial ideas identified as positive / preventive and negative / disciplinary per group.

Results

In this section, we describe the results and the analysis of the PD sessions. Although a full analysis of the results is beyond the scope of this paper, we use the preliminary analysis of six PD groups to illustrate the multimodal method used in order to arrive at a well-founded analysis of the ideas and underlying values.

Preventive Activities and Disciplinary Punishment

Before the creation of the artifacts, all groups had various initial ideas to solve the problematic class situations they had selected. Groups 1, 3 and 6 started out with a balanced number of preventive, positive (e.g. stimulate inclusion) and disciplinary, negative ideas (e.g. punishments). In groups 2, 4 and 5, the positive ideas clearly outnumbered the negative ones – see also figure 3. From the pool of initial ideas, the groups collaboratively selected two ideas for further elaboration. The groups with the balance between positive and negative ideas all selected one positive and one negative idea, while the groups with primarily positive ideas selected two positive ones.

In the evolution from initial ideas to artifacts, it was telling that the negative ideas all but disappeared, even in the groups that had initially selected a negative idea. In the artifact of group 3, the punishing component disappeared entirely. In the artifact of group 1, the punishing component was reduced to 1 out of a collection of 14 artifacts (figure 3), and in group 6, the punishing component was only mentioned in the children's presentation of the artifact, but not present in the material artifact – whereas the positive component was clearly elaborated on in the form of games. This evolution of initial ideas to their material and verbal elaboration points towards a significant shift from negative, disciplinary ideas towards positive ideas.

The Nature of Authority

Groups 3 created an artifact with a human-shaped figure, and groups 4, 5 and 6 all created robots. These groups associated all kinds of functionality to their figures, ranging from ringing a bell when things threaten to go wrong (group 3), to a DJ robot for a class party (group 4 – figure 2, top). Beyond these specific functionalities, these anthropomorphic figures all represent some type of authority – the way the children described their figures verbally and represented them materially is significant for analyzing the specific type of authority. Generally, the robots did not look sterile, but had some kind of personality that was implicitly described in the participants' presentations, and more explicitly visualized in the artifacts.

Figure 2: The 'Rox Box' (bottom) containing 14 artefacts (top) but only one punishing component: the 'Wiggle Machine' on the right.

With the exception of group 6, all robots looked friendly or funny in some way. Group 3 made a kind-looking figure with a big red heart. The figure had an authoritative function: it signalled potential problematic class situations by ringing a bell, and calming the participants highlighted the importance of the figure's appearance, and explained that children feeling sad would feel better by looking at the figure. Group 4 created a goofy DJ robot, who would always create a fun atmosphere, and who would eat all 'bad' ideas. Group 5 created a kind-looking robot that would mediate between bullies and their victims. Only group 6 created a rather severe-looking robot (figure 2, bottom), with a clear regulating, authoritative function (the red-orange-green traffic light on his body). However, the severe, authoritative component was present in the visual appearance of the robot, and mentioned in the children's presentation of the artifact (with a reference to punishment), but not present in the further elaboration – whereas the robot did contain a number of games, the punishing aspect was not elaborated in the artifact. This absence of the disciplinary aspect in the artifact is significant, and suggests that disciplinary punishment is not central to the children's understanding of an ideal tool to prevent and combat (cyber)bullying in a class context.

This analysis shows that where the participants created authoritative figures, most of them were kind or fun. Where a more strict-looking figure was created, the emphasis in the material elaboration was still on the fun (games), rather than on punishment. Therefore, positivity, fun, and kindness.

Discussion

The multimodal analysis allowed the researchers to create rich analyses, and tease out higher-order ideas and values implicitly present in the PD outcomes. For instance, the analysis of several anthropomorphic figures focused not on the specific functionalities of the individual figures, but on their 'personality', as represented implicitly in the children's explanation of their artifact, and more explicitly in the visual appearance of the artifacts themselves. The figures' personalities, then, are linked to underlying values surrounding the prevention and reconciliation of conflict situations. By incorporating verbal data as well as visual characteristics of artifacts, it became easier to move from functional and attribute-focused analyses to more holistic analyses. Consequently, we were able to identify underlying motives behind certain design choices, within and across teams, and how these relate to children's values. This way, designers can go beyond the surface level of cherry-picking participants' ideas, and start from a well-founded analysis of values to define experience goals, and create designs.

The analysis of the making process as a whole traces the emergent and evolving values in the design process, from the invention and selection of verbal ideas to a final, tangible artifact. The multimodal approach allows for an integrated analysis of both verbal information and tangible materials, and assigns the appropriate significance to the artifact. In the analysis of the entire making process, the initial ideas serve a double purpose. First, the initial ideas help grounding the analysis of the artifacts. They clarify the origin and the meaning of the artifact, providing essential, additional information to arrive at a valid interpretation. Second, they provide essential information about the making process: they make it possible to trace the evolution of ideas and underlying values throughout the design process. For instance, the analysis above showed a

clear evolution from both preventive and disciplinary ideas to artifacts centered on the preventive, the positive, and the fun.

Conclusion and Future Work

While the multimodal method for analyzing participatory design outcomes is still under development, we believe that an integrated analysis of verbal and visual/tangible material potentially leads to richer, more in-depth analyses. In our opinion, the current literature on PD analyses offers little guidance on how to approach the analysis of co-designed materials. As such, we aim to contribute to PD research by developing a structured analysis method. As the method is still in development, the 'Fuzzy Front-End of Experience Design' workshop presents an ideal opportunity to discuss and refine the method.

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References

[1] Bardzell, J. (2011). Interaction criticism: An introduction to the practice. *Interact. Comput*. 23(6), 604-621.

[2] Iversen, O.S., Halskov, K., & Leong, T.W. (2010). Rekindling values in participatory design. In *Proc. PDC '10*, p. 92-100. New York, USA: ACM Press.

[3] Jewitt, C. (2013) Multimodal Methods for Researching Digital Technologies. In: Price, S., Jewitt, C., Brown, B. (Eds.) The SAGE Handbook of Digital Technology Research, pp. 250-265. London: Sage.

[4] Scaife, M. and Rogers, Y. (1999). Kids as informants: Telling us what we didn't know or confirming what we knew already, in A. Druin (Ed.), *The design of children's technology*, pp.29-50. San Francisco, CA: Morgan Kaufmann.

[5] Rokeach, M. (1973). *The Nature of Human Values*. Free Press, NY.

[6] Halloran, J., Hornecker, E., & Stringer, M. (2009). The value of values: Resourcing co-design of ubiquitous computing. *Co-Design*, 4(5), 245-273.

[7] Buckingham, D. (2009). 'Creative' visual methods in media research: possibilities, problems and proposals. *Media, Culture and Society*, 31, 633-652.

[8] Sleeswijk Visser, F., Stappers, P.J., van der Lugt, R., Sanders, E.B.N. (2005). Contextmapping: Experiences from practice. *CoDesign: International Journal of CoCreation in Design and Arts*, 1(2), 119-149.

[9] Guha, M.L., Druin, A. & Fails, J.A., 2013. Cooperative Inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design. *International Journal of Child-Computer Interaction,* 1(1), 14-23.

[10] Van Mechelen, M., Gielen, M., Vanden Abeele, V., Laenen, A. and Zaman, B. (2014). Exploring challenging group dynamics in participatory design with children. In *Proceedings of IDC '14.* ACM, NY, 269-272.

[11] Walsh, G., Druin, A., Guha, M.L., Foss, E., Golub, E., Hatley, L., Bonsignore, E. and Franckel, S. (2010) Layered elaboration: a new technique for co-design with children. In *Proc. CHI 2010*. ACM, NY, 1237-1240